WINSOME PUBLISHING
Global Journal of Infectious Diseases and Health Insights ISSN:3064-707X

Research Article Open Access

Major Causes of Organ Condemnation and Economic Significance in Cattle Slaughtered at Hawassa Municipal Abattoir, Southern Ethiopia

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Received date: October 31, 2024; **Accepted date:** November 04, 2024; **Published date:** November 21, 2024

Citation: Dubale Beyene, Major Causes of Organ Condemnation and Economic Significance in Cattle Slaughtered at Hawassa Municipal Abattoir, Southern Ethiopia, Global Journal of Infectious Diseases and Health Insights vol 1(2). DOI: 10.9567/ISSN.2024/WSJ.97

Abstract

Background: A cross sectional study was conducted from November 2015 to April 2016 in Hawassa Municipal abattoir. The aim of this study was to identify the causes of organ condemnation and to assess the economic loss in cattle slaughtered at Hawassa Municipal abattoir due to organ condemnation during meat inspection.

Methods: A cross-sectional study design was conducted and simple random sampling technique was employed. A total of 399 cattle were included in the study. Standard postmortem examination procedures were followed throughout the study period.

Results: Out of the total 399 cattle examined by ante mortem inspection 125(31.31%) having various types of abn ormalities: rough hair coat 26 (6.52%), lacrimation 22 (5.5%), nasal discharge 21 (5.26%), branding 20(1.25%), s alivation 19(4.76%), localized swelling 15 (3.76%), lameness 9(2.25%), fracture 3(0.75%), wart 3 (0.75%), and c oughing 2(0.50). The study revealed that 149(38.3%) liver, 177(44.4%) lung, 31(7.8%) kidney and 33(8.3%) tong ue were rejected due to parasitic and pathological lesion. The Major diseases and/or pathological conditions that c ause a total condemnation were Fasciolosis 64(16%), Calcification 35(8.8%), Hydatid cyst 25(6.3%), Cirrhosis 8(2%), Fibrosis 17(4.3%) for liver; Hydatid cyst 84(21.1%), Emphysema 31(7.8%), Pneumonia 32(8.0%), Atelectas is 20(5%), and Hepatization 10(2.5%), for lung; Hydatid cyst18(4.5%) and Hydronephrosis13(3.3%) for kidney; Cysticercus bovis17(4.3%), and Abscess 16(4.0%) for tongue. An annual direct financial loss due to the rejection of organ from local market is approximately estimated as 48,159,090 ETB was incurred from the study edible organ.

Conclusion and recommendations: The result of this study provided regional information on major causes of organ condemnation in cattle slaughtered at Hawassa Municipal abattoir and direct financial loss due to organ condemnation. In conclusion, the findings from present study used to determine the major causes of organ condemnation and associated economic loss. The current result suggests that thorough investigation that leads to a disease control policy is required to reduce the economic and public health constraints.

Keywords: Abattoir, Cattle, Ethiopia, Organ, Condemnation, Hawassa

Introduction

The world human population is growing at faster rate than food production and this increase is mainly in developing countries, which are unable to assure adequate food for their people. Developing countries have nearly two-third of the world's livestock population, but produce less than a third of the worlds meat and fifth of its milk (1). Ethiopia is a h ome for many livestock species and believed to have the la rgest livestock population in Africa. Ethiopia has the large st livestock population in Africa with an estimated population of 53.99million cattle, 25.5 million sheep, 24.06 million Goats, 1.91 million horse, 6.75 million donkey, 0.35 million mule, 0.92 million camel and 50.38 million poultry (2).

Many animals and their products are used for human consumption in Ethiopia. Red meat, milk, eggs, honey and edible visceral organs are some in the list. One of the losses from endemic disease is expressed in terms of organ condemnation (3). Meat is a perishable commodity, and poor handling daily can exert both public health and economic troll so there should be no room for compliance over problem of meat hygiene, either in developed and in developing countries. Marketing and sale of meat require that the animals are inspected before and after slaughter that the meat hygiene service function i n such a way as to satisfy consumers and at the same time safeguard public health and animal hygiene (4,5,6).

Beside economic loss, disease of cattle, sheep, and goats might constitute an epidemiologic and Zoonotic treat. As such problems concerning meat hygiene and possible health risk to the consumer should be documented during both ante mortem and post mortem examination. In this context, meat inspection data are potential source of information have important role to play in epidemiology and preventive medicine (6). Monitoring and other conditions at slaughter has been recognized as one way of assessing the disease status of herd, however this source of information is not fully exploited worldwide (7). Abattoirs played an important role in surveillance of various disease of human and animal health importance. Surveillance at the abattoir allows for all animals passing in to human food chain to be examined for unusual signs, lesions or specific disease (8).

The importance of ante mortem inspection in the abattoir has long been recognized in an attempt to avoid the introduction of clinically diseased animals into the slaughter hall and should be done within 24 hours before slaughter and repeated if slaughter has been delayed over a day (6). Post mortem inspection should be done immediately after dressing the carcass and the main purpose of postmortem examination is to detect and eliminate abnormalities, to break the chain of some Zoonosis which are not transmitted to man directly via meat like hydatidosis and other important diseases of animals such as fasciolosis, thus ensuring that only meat fit for human consumption passed for food (9,10) Determination of the cause and magnitude of organ and carcass condemnation in animals at abattoir and proper evaluation of associated economic losses are needed where economic realities often determined the type and scope of prevalence measures to be used (9).

There's no sufficient data depicting the cause and related greatness of organ and carcass condemnation in slaughtered cattle in Hawassa Municipal abattoir, southern Ethiopia. Assurance of the cause and size of organ and carcass condemnation in cattle at abattoirs, and appropriate assessment of related financial loss are required where financial substances regularly decide the sort and where financial substances frequently decide the sort and scope of preventive measures to be utilized. Subsequently, the objectives of this study were to recognize the causes of organ condemnation and to survey the financial loss in cattle slaughtered at Hawassa municipal abattoir.

Materials and methods

Description of the Study area

The current study was conducted in Hawassa city. Awasa (also spelled Awassa or Hawassa) is a city in Ethiopia, on the shores of Lake Awasa in the Great Rift Valley. It is located 270 km south of Addis Ababa via Debre Zeit, 130 km east of Sodo, and 75 km north of Dilla. The town serves as the capital of the Southern Nations, Nationalities, and Peoples' Regional state (SNNPR), and is a special zone of this region. It lies on the Trans-African Highway 4Cairo-Cape Town, and has latitude and longitude of 7°3′N38°28′Eand an elevation of 1708 meters. The maximum and minimum annual rainfall and temperature are 1100, 900 mm and 27°C and 13°C, respectively.

Study Animals

The study animals were local and cross breed cattle brought from Arsi-negele, Tulu, Borana, Shashemene, Tikurwoha, Dimittu, Dilla, and Hawassa. They brought to abattoir using vehicle and on foot which include both male and female sexes, adult and old age group's weather they are from intensive or extensive farming systems which come to Hawassa municipal abattoir for slaughtering purpose. A total 399 Cattle destined for slaughter were inspected during ante mortem and post mortem examinations with their specific identification number.

Study Design

A cross sectional study design was employed from November 2015 to April 2016 to identify the major cause of organ condemnation in Hawassa municipal abattoir and to evaluate the direct financial losses incurred due to organ condemnation. The study animals were selected using simple random sampling method.

Sample size determination

The desired sample size was calculated using the standard formula described by (11) for simple random sampling method. Since there was no previous work done on this area, the expected prevalence is guessed to be 50%. Therefore, the sample size in this study was calculated using the following formula.

$n = \frac{1.96^2 (p) (1-p)}{}$

d^2

Where;

n = sample size required,

P = expected prevalence (50%)

1.96 = the value of z at 95% confidence level

d = desired level of precision (5%).

Therefore: $n = \frac{1.96^2 (0.5) (1- 0.5)}{0.0025} = 384$ samples

Hence, the sample size required as per the above formula was 384 heads of cattle. But to increase the precision of the study the sample size were increased and a total of 399 cattle were included in the current study.

Abattoir survey

Ante mortem examination

Ante-mortem examination was conducted on individual animals, while the animals entering into the lairage and in mass after they entered into the lairage. Both sides of the animals were inspected at rest and in motion. In each week, two days visit will be made for ante mortem inspection on individual animals. Moreover, the general behavior of the animals, cleanness, and sign of diseases and abnormality of any type were recorded according to the standard ante-mortem inspection procedures (4) ,and based on this judgment was done.

Postmortem examination

During postmortem inspection liver, lungs, heart, kidney, and tongue were thoroughly inspected by visualization, palpation and making systemic incisions for the presence of cysts, parasites and other pathological conditions. Pathological lesions were differentiated and judged according to guidelines on meat inspection for developing countries and the results were recorded and the decisions at postmortem inspection are classified in to the following categories of judgment such as approved as fit for human consumption, conditionally approved as fit for human consumption, totally condemned as unfit for human consumption and partially condemned as fit for human consumption (4). Organs which are totally condemned due to parasitic diseases and pathological conditions are considered in my current study.

Direct financial loss assessment

To assess the economic losses, only direct economic losses was considered and the calculation based on totally condemned organs like liver, lungs, kidney, and tongue was conducted. To calculate cost of condemned edible organs, Meat inspector of Hawassa Municipal abattoir was interviewed to establish the price per unit organ and the average organ price was determined and this price index is used to calculate the loss (12). The analysis carried out based on annual slaughter capacity of the abattoir, market demand, and average market price of each organ in Hawassa city and the rejection rate of specific organ. Direct economic losses estimated based on the formula derived by (13). Total annual loss =Rate of organ condemnation * total animal slaughtered per annum * estimated current price of the organ.

Data Management and Statistical analysis

Collected data were entered and stored in to Microsoft excel spread sheet. The data analysis was done using STATA 11® (14). Descriptive statistics were used to determine the level of organ condemnation defined as the proportion of condemned organs to the total number of organs examined.

Results

Overall prevalence

Out of 399 cattle slaughtered at Hawassa municipal abattoir 125 (31.31%) of them had various types of abnormalities during ante mortem inspection and the detail of the list shown on Table-1. According to the information obtained from abattoir, averagely 80 cattle's were slaughtered per day.

Common causes of organ condemnation and financial significance

From the total cattle slaughtered 149(37.4%) liver, 177(44.4%) lungs, 31(7.8%) kidneys, 33(8.3%) tongue was totally condemned. The detail of common causes of visceral organs condemnation and the percentage of the condemnation due to the pathological conditions are presented in Table 4. Information collected from Abattoir Butchers and Meat Inspectors on the mean current price of visceral organs at Hawassa city for liver, lung, kidney and Tongue were 80, 5, 35, and 60 Ethiopian Birr, respectively. The abattoir record from 2014 to 2015 revealed that the mean annual slaughter were 21,000 cattle. The total annual direct financial loss incurred due to rejection of visceral organ is estimated to be 48,159,090 Ethiopian Birr/year. The financial loss due to fasciolosis, hydatidosis, calcification, emphysema, pneumonia, cysticercus bovis and other causes are 17,203,200, 7,660,170, 5,174,400, 253,890,268,800, 9,210,600 and 8,388,030 Ethiopian Birr, respectively (Table-2).

Table 1: Disease condition or abnormalities encountered during ante mortem inspection in Hawassa Municipal abattoir, 2016 (n =399)

Abnormal conditions	No. (%) of cattle affected	Abnormality percentage
Lacrimation	22(5.51%	17.6%
Branding	5.0(1.25%)	4%
Localized swelling	15(3.76%)	12%
Nasal discharge	21(5.26%)	16.8%
Wart	3(0.75%)	2.4%
Fracture	3(0.75%)	2.4%
Rough hair coat	26(6.52%)	20.8%
Salivation	19(4.76%)	15.2%
Lameness	9(2.25%)	7.2%
Coughing	2(0.50%)	1.6%
Total	125(31.31%)	100%

All animals that had been examined by ante mortem inspection were slaughtered during post mortem inspection with a great care. A total of 399 cattle were slaughtered and thoroughly examined by following standard postmortem inspection procedure. Out of inspected Liver, 149(37.4%) were condemned due to fasciolosis, calcification, hydatid cyst, fibrosis, and cirrhosis, with a condemnation rate of 64(16.0%), 35(8.8%), 25(6.3%), 17(4.3%) and 8(2%) were to be the main causes of liver condemnation respectively.

In line with causes of lung condemnation, hydatid cyst, pneumonia, emphysema, atlectasis and hepatization were found to be the major causes of lung rejection. From total number of rejected lungs, 177(44.4%); 25(21.1%); 32(8.0%), 31(7.8%), 20(5.0%), and10 (2.5%) were rejected due to H. cyst, Pneumonia, Emphysema, Atlectasis and hepatization respectively. Hydronephrosis and hydatid cyst were the main causes of kidney condemnation. Out of inspected kidney, 31(7.8%) of them were condemned due to hydronephrosis and hydatid cyst with condemnation rate of 18(4.5%) and 13(3.3%), respectively.

Out of inspected tongue, 33(8.3%) of them were condemned due to cysticercus bovis and abscess with condemnation rate of 17(4.3%) and16 (4.0%), respectively.

Table 2: Causes, percentage of organ condemnation and financial losses analysis at Hawassa Municipal abattoir, 2016. (n=399)

Condemned organ	Disease Conditions	No. (%) of organ condemned	Percent of the total condemnation	Loss of Money (ETB)
Liver	Fasciolosis	64(16%)	42.95%	17203200
	Hydatid cyst	25(6.3%)	16.78%	2646000
	Calcification	35(8.8%)	23.5%	5174400
	Cirrhosis	8(2%)	5.4%	268800
	Fibrosis	17(4.3%)	11.41%	1228080
	Total	149(37.4%)	100%	26520480
Lung	Hepatization	10(2.5%)	5.6%	26250
	H. cyst	84(21.1%)	47.5%	1861020
	Emphysema	31(7.8%)	17.5%	253890
	Pneumonia	32(8.0%)	18.1%	268800
	Atlectasis	20(5.0%)	11.3%	105000
	Total	177(44.4%)	100%	2514960
Kidney	Hydronephrosis	18(4.5%)	58.1%	5953500
	H .cyst	13((3.3%)	41.9%	3153150
	Total	31(7.8%)	100%	9106650
Tongue	C. bovis	17(4.3%)	51.5%	9210600
	Abscess	16 (4.0%)	48.5%	806400

	Total	33(8.3%)	100%	10017000

Table 3: Findings of the study used in the direct financial loss assessment Hawassa Municipal abattoir, 2016.(n =399)

Organs	Average rejection rate of organs	Average of annual cattle slaughtered	Average price of organs
Liver	149(37.4%)		80
Lung	177(44.4%)	21,000	5
Kidney	31(7.8%)		35
Tongue	33(8.3%)		60

Table 4: Common causes of visceral organs condemnation and the percentage of the condemnation due to the pathological conditions Hawasa Municipal abattoir, 2016.(n =399)

Organs	Organs condemned	Fas	Hyd	Cal	Cir	Fib	Emp	Pneu	Atle	Hep	H. nep	C.bovis	Abs
Liver	149	64	25	8	8	17	-	-	-	-	-	-	-
Lung	177	-	84	-	-	-	31	32	20	10	-	-	-
Kidney	31	-	13	-	-	-	-	-	-	-	18	-	-
Tongue	33											17	16

*Fas=Fasciola, *Hyd=Hydatid cyst, *Cal= Calcification, *Cir= Cirrhosis,*Fib=Fibrosis, *Emp=Emphysema, *Pneu= Pneumonia, *Atle= Atlectasis, *Hep= Hepatization, *H. nep= Hydronephrosis, *C. bovis= Cysticercus bovis, *Abs= Abscess.

Table 5: Summary on parasitic and pathological condemnation of organ Hawasa Municipal abattoir, 2016.(n =399)

Cause	Rate of condemnation (%)			
	Liver	Lung	Kidney	Tongue
Parasitic	89(22.3)	84(21.1)	13(3.3)	17(4.3)
Pathological	60(15.1)	93(23.3)	18(4.5)	16(4.0)
Total	149(37.4)	177(44.4)	31(7.8)	33(8.3)

Table 6: Over all summary of economic loss Hawasa Municipal abattoir, 2016. (n =399)

Description	Liver	Lung	Kidney	Tongue
Cost of total condemnation	80	5	35	60
Total cost of total condemnation	26520480	2514960	9106650	10017000

Discussion

Most inspection is conducted in the abattoir for the purpose of screening and removing animal product with abnormal pathological lesion unsafe for human consumption and having poor aesthetic value. An important function of meat inspection is to assist monitoring disease in the national heard and flock by providing feedback information to the veterinary service to control disease and to produce wholesome product and to protect the public from Zoonotic hazards [15].

According to the present study, the most encountered abnormalities during ante mortem examination (AME) were rough hair coat, lacrimation, nasal discharge, branding, salivation and localized swelling .The nasal discharge might be due to stress, immune suppression, Overcrowding in the holding pens of the abattoir, during transportation and respiratory diseases. The localized swelling might be due to trauma while being driven to market places and during transportation to the abattoir by inappropriate vehicles.

This study showed that hydatid cyst, Fasciolosis, calcification, pneumonia, emphysema, C. bovis, cirrhosis, Fibrosis, hepatization, and hydronephrosis, were the causes of organs condemnation in cattle slaughtered at Hawassa municipal abattoir. The present findings indicated that a high number of livers were condemned due to various abnormalities. Of these, Fasciolosis and calcification were found to be the major causes for liver rejection from local market. In the current abattoir survey, 16%of the animals' liver abnormalities were found to be caused by fasciolosis. This finding is comparable with the value reported by (16).and (17) with a prevalence of 14% and 14.04% in Hai, Tanzania and Wolaita Sodo, Ethiopia, municipal abattoirs, respectively. However, this result was higher than the value reported by (18) and (19) with a prevalence of 8 and 8.2 %, from Nigeria and Kenya, respectively. On the other hand, this result was lower than reports of (10, 20, 21, 22, 23,24,25) as 37%, 46% ,46.2%,56.6%,35.2%,24.32% and 18.4% from Kafue in Zambia, Mekelle, Jimma, WolayitaSodo, Mekelle, AddisAbaba, and Wukro municipal abattoirs in Ethiopia, respectively.

These differences can be attributed to the difference in agro ecological condition and strategic control of internal parasites in the areas. Losses from liver condemnation were assumed to occur since hepatic pathology is associated to infection that might have public health importance and aesthetic value (26)

The prevalence of calcification on liver was 8.8 % in this study which was comparable with the result 8.18% reported by (27) from Kombolcha and higher than the 1.9% reported in Tanzania (7). The actual cause of the calcification in the present study was not established but problems like cirrhosis, hydatidosis, fibrosis and others might be the cause.

The 2.5% liver condemnation rate due to cirrhosis which is found in the present study is relatively higher than the finding of (28) who reported 1.1% rate of rejection for cattle slaughtered in Gondar ELFORA abattoir but lower than report by (29) in which 12.8% rate of rejection was found from cattle slaughtered in Nigeria abattoir.

In the current finding the overall prevalence of hydatidosis at Hawassa municipal abattoir was 30.6%. It affected most of the visceral organs such as lungs, liver and kidney but it has been observed that it occurred predominantly in the lung than other organs (21.1%). This finding is closer to that reported by (30) from Mekelle (28.09%), and respectively; lower to that reported by (21, 31, 32, 33, 34, 35) from Mekelle (32.1%), Shire (32%), Adama,(46.8%), DebreMarkos (48.5%), Hawassa (52.7%) and Greece 82% respectively. This finding was higher than the report of (12, 36, 37, 5) (15.2%) from Gondar, Tigray, Sudan and Wolayita Sodo abattoirs respectively. Factors like differences in culture, social activity, systems of animal husbandry, lack of proper removal of infected carcass and approach to dogs in various regions might have accounted for variation of the prevalence in different areas of a country (12) The lung is the most frequently having hydatidosis due to its size, blood supply and availability of oxygen supply (38)

Pneumonia is the second important disease for lung condemnation in this abattoir during the study period. The prevalence of pneumonia was 8.0%. This finding was closer to the 8.8% and 4% rejection rate reported by (39) in cattle slaughtered at Zaria and (40) in Tanzania and it was higher than that reported 0.14% and 1% in cattle slaughtered at Zango abattoir (41) and 1% report in North Ethiopia (42). A number of factors may explain the high prevalence of pneumonic lungs, including stress factors such as exposure to dust from the environment or exhaustion during long treks of pastoral livestock in search of pasture and water, and when animals are taken to livestock markets or abattoirs and parasitism (43, 44)

The prevalence of emphysema in this study was 7.8% which is closer to the results 6.77% , 10.5% ,4.4% and 8.8% reported by (38, 45) at Jimma, at Gondar abattoirs,(46) at Northern Ethiopia and (47) at Sebeta respectively. Although this finding was higher than 1.61%, and 1.73%, reported by 48) at Adigrat and (42) at Tanzania.

The present study also showed that kidney was rejected due to hydatid cyst with condemnation rate of 3.3%. This result

is in agreement with previous studies by (45) from Gondar abattoirs. However, according to (12) from Gondar and (38) from Jimma, higher rejection rate of kidney was due to hydronephrosis.

The prevalence of bovine cysticercosis was identified as a cause of total condemnation of organ and carcass. In this study, its prevalence was 4.3% in tongue which is comparable with 5.73% reported by (49) from Adigrat. Although this finding is lower than 13.3%, and 42.85%, reported by (50) from Wolayita and (45) from Gondar, respectively and the finding was also higher than the value 0.02% reported by (10) from Zambia. The prevalence of Abscess in Tongue was identified as a cause of total condemnation of tongue with a rate of 4.0% in this study. This finding is lower than 42.85%, reported by (45) from Gondar abattoirs and higher than 0.2% reported from Zambia (10)

The economic analysis of livestock disease in Ethiopia is scarce and inadequate because of lack of information on prevalence and complexities of analysis (9). The direct financial loss incurred during this study as a result of condemnation of different organs of cattle was estimated about 48,159,090 ETB per annual. Therefore, the total annual financial loss due to major parasites in the study abattoir is the summation of losses from organ condemnation. This finding is by far higher than the result reported by (51, 52, 53, 23, 54) a total financial loss of about 150,048.98, 110,584.046, 19,910.0, 233,501.94 and 88,806.85 Ethiopian birr per annum in catt le due to major cause of organ condemnation at Gondar M unicipal abattoir, Luna Export Abattoir,

Adigrat, Mekelle and Hosana municipal slaughter houses, respectively. This is probably due to the ecological and climatic difference between those localities. According to (50) losses due to hydatidosis was estimated to be 1,791,625.89 ETB annually. Similarly the annual economic loss in Ambo and Sodo Municipal abattoir was estimated to be 160,032.23 and 4000 USD as reported by (55,17) respectively.

Conclusion and recommendation

Disease is the major concern to the livestock industry as it causes extensive financial waste as a result of direct and indirect economic loss. According to the result of this study, Fasciolosis, calcification, Pneumonia, Emphysema, H.cyst, Atlectasis, Hydronephrosis and *C. bovis* are the most and major causes for respective organs of cattle to render from local market and this results extensive financial loss about 48,159,090 ETB per annum. Hence this study may valuable to give regular current information on parasitic and pathological lesions in addition helps to estimate economic loss that the country losses every year. Based on the over conclusion the following recommendation is required:

- ✓ Diverse procedures ought to be created to minimize condemnation of organs due to the dynamic nature of the diseases.
- ✓ Bluchers should be aware about safe handling and transporting of butchered creatures to prevent stress.
- ✓ Preparing ought to be advertised to abattoir workers on ante-mortem and post- mortem inspection.
- ✓ Water supply and squander transfer systems should be given extraordinary consideration by the abattoir personnel.
- ✓ The study of disease transmission of those disease causing organ and carcass condemnation ought to be examined in detail and control measures ought to be undertaken.
- ✓ Government ought to give the abattoir with satisfactory offices for effective meat assessment methods with compelling control of rejected meat and offal for appropriate transfer of condemned offal and great administration of abattoir.

References

1. Food and Agriculture Organization, (1995): Manual of meat inspection for developing countries. FAO. Animal Production and Health.
2. CSA. (2013): Agricultural sample survey. Report on livestock and livestock characteristics. The Federal Democratic republic of Ethiopia, Central St atistical Agency (CSA). Private Peasant Holdings. Statistical Bulletin 570, Addis Ababa, Ethiopia, April, 2013.
3. Teka, G. (1997): Meat hygiene. In: Food hygiene principles and methods of food born disease control with special reference to Ethiopia. Pp: 99-113.
4. FAO, 1994.Manual on meat inspection for developing countries. Animal and health production papers food and agriculture organization of the United Nations Rome. Italy, Pp: 5-9.
5. Kebede, N. (2010): A retrospective survey of bovine hydatidosis in three abattoirs of Amhara National Regional State, northwestern Ethiopia. *Trop. Anim. Health. Prod*. **42**(3), 323-325.
6. Graccey, J. F., Collins D. S., and Huey, R.J. (1999) : Meat Hygiene, 3rd edition. W. B. Saunders Company Ltd., Pp. 669-678.
7. Mellau, L. S. B., H. E. Nonga., E.D. Karimuribo. (2 010): A slaughter house survey of liver lesions in

slaughtered cattle, sheep and goats at Arusha, Tanzania. *Res. J. Vet. Sci*., **3**, 179-188.

8. Alton, G. D., Lpeah, D., Bateman, K. J., Mc Nab, W. B., and Berk, O. (2010): Factors associated with whole condemnation rates in provincially inspected abattoir in Ontario 2001-2007: Implication for food animal syndrome surveillance. BMC *Vet. Res*. 6:42.
9. Jibat, T. (2006): Cause of organ and carcass conde mnation at Asella Municipal Abattoir. DVM Thesis, Addis Ababa University, Faculty of Veterin ary Medicine Debrezait, Ethiopia. Pp: 1-12.
10. Phiri, A.M. (2006): Common conditions leading to cattle carcasses and offal condemnations at three abattoirs in western province of Zambia and their Zoonotic implications to consumers. Journal of South African Veterinary Association, **77**, 28-32.
11. Thrusfield, M. (2005): Veterinary Epidemiology. 2nd ed. UK: Black Well Science. p180.
12. Yifat, D., Gedefaw, D., and Desie, S. (2011): Major Causes of Organ Condemnation and Financial Sig nificance of Cattle Slaughtered at Gondar Elfora A battoir, Northern Ethiopia, Global Veterinaria **7** (5), 487-490.
13. Torgerson, P. R., and Dowling, P. M. (2001): Estim ating the economic effects of cystic echinococcosis Part2: An endemic region in the United Kingdom, a wealthy, industrialized economy. *Ann. Trop. Med. Parasitol*. **95**(2), 177-85
14. STATA version 11 for window 4905 Lake way Drive, College Station, survey of *cystic echinococcosis* in Sudan. *Vet.Paras.***169**, 340–346.
15. Gracey, J. (1986): Meat Hygiene. 8th ed. London: Baillere Tindall. Pp, 123-265.
16. Swai, E., and E, Ulicky. (2009): An evaluation of t he economic losses resulting from condemnation of cattle livers and loss of carcass weight due to fasci olosis: A case study from Hai town abattoir, Kilima njaro region, Tanzania. Tanzanian Livestock Resea rch for Rural Development, http://www.lrrd.org/lrrd21/11/swai21186.htm.
17. Abunna, F. L., Asfaw, B., Megersa, A., Regassa. (2 010): Bovine fasciolosis: Coprological, abattoir survey and its economic impact due to liver condemnation at Sodo Municipal Abattoir, Southern Ethiopia. Tropical Animal Health and Production, **42**, 289-292.
18. Okoli, I. C. E. C., Agoh, G. C., Okoli, G. C., Idemi., and D. O. Umesiobi. (2000): Bovine and Caprine Fasciolosis in Enugu State of Nigeria: Retrospective analysis of abattoir records (1983- 1997) and six-month prevalence study, Bulletin of Animal Health and Production for Africa, **48**, 7-11.
19. Kithuka, J. M. N., Maingi and., F.M. Njeruh. (2002): The prevalence and economic importance of bovine Fasciolosis in Kenya: an analysis of abattoir data, Ondestepoort, Journal of Veterinary Research, **69**, 255-62.
20. Tadele, T., Worku, T. (2007): Prevalence and Economic Significance of Bovine Fasciolosis at Jimma, Abattoir, Ethiopia.*The Internet J. Vet. Med.*3:15.
21. Berhe, G. K., Berhane., and G. Tadesse. (2009): Pr evalence and economic significance of fasciolosis i n cattle in Mekelle area of Ethiopia. Tropical Anim al Health and Production, **41**: 1503-1504.
22. Tolossa, T., Tigre, W. (2007): The prevalence and economic significance of bovine fasciolosis a Jimm a, abattoir, Ethiopia. *Internet. J. Vet. Med*. 3.
23. Shegaw, S., Ashwani, K., and Kassaw, A. (2009): Organs condemnation and economic loss at Mekelle municipal abattoir, Ethiopia. Haryana Vet. Pp 17-22.
24. Gebretsadik, B., Kassahun, B., and Gebrehiwot, T. (2009): Prevalence and economic significance of F asciolosis in slaughtered cattle in Addis Ababa Aba ttoir, Ethiopia. Global Veterinaria, **8**, 115-118.
25. Hadush, T., Nigus, A., and Niraj, K. (2015): Abatto ir prevalence of bovine fasciolosis in the municipal abattoir of Wukro, northern Ethiopia. Journal of int ernational academic research for multidisciplinary.
26. Budke, C. M. P., Deplazes., and P. R. Torgerson. (2 006): Global socio economic impacts of cystic echinococcosis. *Emerging infectious Diseases Journal*, **12**, 296-302.
27. Nurit, M., Zerihun, H., Serkalem, M. (2012): Major cause of liver condemnation and associated financial loss at Kombolcha Elfora Abattoir, South Wollo, Ethiopia. European Journal of Applied Sciences **4** (4), 140-145.
28. Denbarga, Y., Demewez, G., and Sheferaw, D. (20 11): Major Causes of Organ Condemnation and Fin ancial Significance of Cattle Slaughtered at Gondar Elfora Abattoir, Northern Ethiopia. *Glob.Vet***.7**, 487-490.
29. Alawa, C. B., Etukudo, Joseph, I., Alawa, J. N. (20 10): A six year survey of pathological condition of slaughtered animals at Zango Abattoir in Zaria, Ka

duna State, Nigeria. *Trop. Anim. Heal. Prod*. **43**, 127-131.

30. Dawit. (2008): Prevalence of bovine hydatidosis at Mekelle municipal abattoir; DVM thesis, Faculty of veterinary medicine, Alemaya University, Ethiopia.
31. Asmerom Asfaw and Berihun Afera (2014): Prevalence of Hydatid Cyst in Cattle at Municipal Abattoir of Shire. *Journal of Veterinary Science and Technology*. 5:3
32. Kebede, N. A., Abuhay, G., Tilahun., and A. Woss ene. (2009a): Financial loss estimation, prevalence and characterization of hydatidosis of cattle slaught ered at Debre Markos municipality abattoir, Ethiopia. Tropical Animal Health and Production, **41**, 1787-1789.
33. Getaw, A. D., Beyene, D., Ayana, B., Megersa, F. Abunna. (2010): Hydatidosis: prevalence and its economic importance in ruminants slaughtered at Adama municipal abattoir, central Oromia, Ethiopia. *Acta Tropica*, **113**, 221-225.
34. Regassa, F., A. Molla., and J. Bekele. (2010): Study on the prevalence of cystic hydatidosis and its economic significance in cattle slaughtered at H awassa Municipal abattoir, Ethiopia. Tropical animal Health Production.**42**, 977-984.
35. Borji, H., Parandeh, S. (2010): Abattoir condemnation of meat because of parasitic infection, and its economic importance: results of a retrospective study in north–eastern Iran. *Ann. Trop. Med. Parasitol*.**104** (8): 641–647.
36. Kebede, W. A., Hagos, Z., Girma and F. Lobago, (2009b): Echinococcosis/ hydatidosis: its prevalence , economic and public health significance in Tigray region, North Ethiopia. Tropical Animal Health and Production, **41**, 865-871.
37. Elmahdi, I. E. Q. M., Ali, M. M., Magzoub, A. M., Ibrahim, M. B., Saad and T. Romig. (2004): Cystic echinococcosis of livestock and humans in c entral Sudan. Annals of Tropical Medicine and Parasitology, **98**, 473-479. USA: Florida, Pp: 11-14.
38. Amene, F., Eskindir, L., and Dawit, T. (2012): The Cause, Rate and Economic Implication of Organ Condemnation of Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia. Global Veterinaria, **9**(4), 396-400.
39. Raji, M. A., Salami, S. O., and Ameh, J. A. (2010): Pathological condition and lesions observed in slaughtered cattle at Zaria abattoir. *J. Clini. Patho. Forensic. Med*. **1,** 9-12**.**
40. Clement, B. J. I. J., Alawa., and B. L. Joseph. (2010): A 6-year survey of pathological conditions of slaughtered animals at Zango abattoir in Zaria, Kaduna State, Nigeria. Tropical Animal Health and Production, **43**, 127-131.
41. Radostitis, O. M. C. C., Gay, D. C., Blood, K. W., Hencheliff. (2000): Veterinary Medicine, The text book of diseases of cattle, sheep, goats, pig and horses, 9ed. London: Bailliere Tindall, Pp: 1378-1383.
42. Genet, M., Tadesse, G., Basaznew, B., Mersha, C. (2012): Pathological Conditions Causing Organ and Carcass Condemnation and Their Financial Losses in Cattle Slaughtered in Gondar, Northwest Ethiopia. *African. J. Basic & Appl. Sci*. **4** (6), 200-208.
43. Amuamuta, A., Akalu, B. and Chanie, M. (2012): Major causes of lung and liver condemnation and financial impact in cattle slaughter at Bahir Dar Municipal Abattoir. African. Journal Basic Applied Science., 4: 165-171
44. Haylegebriel, T., and Alembrhan, A. (2014): Cysticercosis bovis in Eastern Tigray, Northern Ethiopia. International Journal of Innovation and Scientific Research Pp. 522-526.
45. Regassa, A. F., Abunna, A., Mulugeta, B. Megersa. (2009). Major Metacestodes in cattle at Wolayita-Sodo municipal abattoir, Southern Ethiopia: Prevalence, cyst viability, organ distribution and socio-economic implications. Tropical Animal Health and Production, **41**, 1495-1502.
46. Fasil, B. (2009): Major cause of organ condemnation in cattle slaughtered at Gonder ELFORA abattoir, Faculty of Veterinary Medicine, Jimma University, DVM Thesis.
47. Alemayehu, R., Nebyou, M., Bekele, M., Desta, B., Dessie, Sh., Etana, D., Fufa, A., Eystein S. (2012): Major causes of organs and carcass condemnation in small ruminants slaughtered at Luna Export Abattoir, Oromia Regional State, Ethiopia. *Prev. Vet. Med*. **110** (2), 139-148.
48. Alembrhan, A., and Haylegebriel, T. (2013): Major causes of organ condemnation and economic loss in cattle slaughtered at Adigrat municipal abattoir, Northern Ethiopia. Veterinary world, **6**(10), 734-738.

49. Bekele, Ch., Sissay, M., Mulugeta, D. (2014): On F arm Study of Bovine Fasciolosis in Lemo District and its economic loss due to liver condemnation at Hossana Municipal abattoir, Southern Ethiopia. *Int. J. Curr. Microbiol. App. Sci.***3**(4), 1122-1132.

50. Zewdu, E., Teshoma, Y., Makaoya, A. (2008): Bovine Hydatidosis in Ambo Municipal abattoir, West Shoa, *Ethiopia,Ethiop.Vet.Journal*.2010,**11**(1),1-4